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Changes in appearance of amniotic fluid during pregnancy – The macroscore

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WOYTON [5] mentioned the appearance of amniotic fluid as in indicator of fetal maturity as early as 1963; this so easily accessible aspect, however, has since received little attention.

The relationship between the appearance of amniotic fluid, determined by its degree of cloudiness and the number of flakes of vernix in it, and the duration of pregnancy, was described in more detail by SEELEN [1] and WLADIMIROFF and others [4] (Tab. I).

In the first trimester of pregnancy the amniotic fluid is clear and yellow; from the 16th–20th pregnancy week the yellow colour begins to diminish until the liquid is colourless at the 35th–36th

Curriculum vitae

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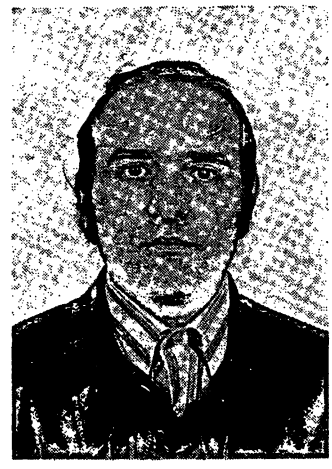

Tab. I. Changes in the appeance of amniotic fluid from the 14th week of pregnancy up to term. (WLADIMIROFF, VERPOEST, SEELEN [4]).

Duration of pregnancy (weeks)	colour	cloudiness	flakes
14–15	yellow, with a touch of green	clear	no
16–32	yellow	clear	no
32–36	change into yellow-colourless	clear	no
36–37	colourless	almost clear	few flakes, big, whitish-greasy, floating on the surface after centrifugation.
37–38	colourless	slightly cloudy	except for the flakes mentioned above, small whitish-grey flakes appear. Sedimentation in case of centrifugation.
38–at term	colourless	increasingly cloudy	floating flakes disappear; increase of small sedimenting flakes, present as separate particles.
at term	colourless	moderately cloudy	moderate amount of small grey-white flakes, present as separate particles.

week. From this time on the amniotic fluid begins to become cloudy and a minute quantity of flakes of vernix begins to appear.
This cloudiness and the number of flakes gradually increase until the amniotic fluid is moderately cloudy and contains a moderate amount of flakes of vernix at term.

1.1 The macroscore

VERPOEST and SEELEN [2] introduced a system to express the degree of cloudiness and the quantity of flakes present as a score which they called macroscore.
Both the degree of cloudiness and the quantity of flakes are expressed by a score, the scale running from 0, for no cloudiness or no flakes, to 6, for very cloudy or a very great number of flakes.
The macroscore may therefore vary between 0 and 12 (Tab. II). In this study we further test the significance of the macroscore in relation to the duration of pregnancy.

Tab. II. Macroscore; score system for the degree of cloudiness and the amount of flakes of vernix in the amniotic fluid (VERPOEST and SEELEN, [2]).

degree of cloudiness/amount of flakes	score
no	0
±	1
+	2
+±	3
++	4
++±	5
+++	6

		score		score
cloudiness	none	0	very heavy	6
amount of flakes	none	0	very heavy	6
macroscore		0		12

1.2 Method of testing the macroscore

First an investigation was carried out to what extent the subjective assessment of cloudiness and of the quantity of flakes, are a justified and useful measurement for the macroscore.
For this purpose three independent observers, each with different experience in evaluating amniotic fluid, allocated a macroscore to 42 random samples of amniotic fluid. There was a significant positive correlation between the macroscore of the three observers (Pearson correlation coefficient between researchers 1 and 2 : 0.87, between researchers 2 and 3 : 0.82 and between researchers 1 and 3 : 0.90). Analysis of variance showed no difference in level between the observers ($p = 0.48$). The standard deviation between the observers was 1.2.
Testing the macroscore obtained by these three observers against an objective parameter, i.e. the optical density at 750 (OD 750), showed for each observer a significant correlation between the two (the Pearson correlation coefficient for observer 1 was 0.79, for observer 2 0.67 and for observer 3 0.88; observer 3 was the most experienced observer, observer 2 the least experienced one). Moreover, testing the macroscore of 244 samples of amniotic fluid against the optical density at 750 also showed a significant linear correlation ($p = 0.803$).
These statistics were performed by W 't Mannetje, Mathematisch-Statistisch Advies afdeling (Head of department Ph. v. ELTEREN), Katholieke Universiteit Nijmegen.
Based on these points the macroscore seems an acceptable parameter for expressing the degree of cloudiness and the amount of flakes of vernix present in amniotic fluid.

2.1 Investigation of the amniotic fluid

The amniotic fluid is obtained by transabdominal amniocentesis; the colour and macroscore are assessed immediately.
All pregnant women were healthy and had a normal pregnancy, the duration of which was known. They delivered healthy children of over 2750 gr.
Basically, pregnant women may be divided into two groups: one group where amniocentesis may be regarded as a control-procedure during normal pregnancy (188 women, 484 tests) and another group where amniocentesis was carried out because pregnancy exceeded 40 weeks (141 women, 229 Tests).
From each pregnant woman only the amniotic fluid obtained at the first amniocentesis is involved

in this study, i.e. one sample per woman, unless otherwise stated.

2.2 Definitions

Duration of pregnancy: number of days or weeks from the first day of the last menstrual period; the expression in weeks is as follows, a pregnancy with a duration of "n" weeks comprises a pregnancy of "n" weeks ± 3 days (for example 40 weeks is from the 227th up to and including the 283rd day).
Total gestation period: number of weeks n ± 3 days or number of days from the first day of the last menstrual period up to and including the day of birth.

3 Results

3.1 Macroscore and duration of pregnancy

The mean macroscore (Fig. 1) up to the 32nd week of pregnancy is 0; the amniotic fluid is clear and does not contain any flakes. Subsequently, up into the 36th week the mean score is 1–2, the amniotic fluid has a trace of cloudiness and it contains some very small flakes.
From the 36th week onwards the mean score starts to increase, slowly at first and then increasingly faster into the 40th week of pregnancy; the mean score is then 7.8 ± 3.1; the amniotic fluid is moderately cloudy and it contains a moderate amount of flakes. **During the 41th week the mean macroscore drops**; thereafter the average score increases again to 9.3 ± 2.5 in the 42nd week, i.e. considerably cloudy with a fairly large amount of flakes.
In pregnant women on whom more than one amniocentesis was carried out, the cumulative average increase of the macroscore per week (Fig. 2) shows that the increase between the 32th and 37th week of pregnancy is progressive, then linear until into the 40th week. In the 41th week this linear increase is displaced parallel by one week.

3.2 Macroscore near term

The macroscore per day and per half week from the 39th up to and including the 42nd week (Fig. 3, Tab. III) shows that the score increases into the second half of the 40th week (8.5 ± 2.7) with the highest score on the 281 and 282nd day. (8.6 ± 1.0; 8.8 ± 4.1). In the first half of the 41th week the mean score is then considerably lower (7.7 ± 3.1) (χ^2 test $p < 0.05$), after which it increases again, but in the second half of the 41th week (8.0 ± 3.3) it is still lower than in the second half of the 40th week (χ^2 test $0.05 < p < 0.01$).
The distribution of the frequencies of the macroscores in the different stages of pregnancy (Fig. 4) shows that the increase of the mean macroscore up to the first half of the 40th week is caused by a steady decrease in the lower scores and a strong increase in the medium scores; the higher scores increase only slightly. In the second half of the 40th week the lower scores decrease even more; the higher mean macroscore during this week however is mainly caused by a decrease in the medium scores in favour of the higher scores. The subsequent decrease of the mean macroscore in the 41th week is based on a suddenly occurring increase in the lower scores at the expence of the higher scores. The mean macroscore subsequently increases again because of a strong reduction in the lower scores with a simultaneous increase in the higher scores; the percentage of cases of amniotic fluid with medium scores remains almost constant. Thus, the 41th week of pregnancy is characterised by a sudden increase in cases of amniotic fluid with a lower score; this is the cause of the reduction in the mean macroscore in this week.

3.3 Macroscore and birth

Fig. 5 and Tab. IV show that **the earlier the delivery, the earlier occurs the increase in macroscore.** In other word the score always increases in the days before delivery regardless of the duration of gestation. In the later weeks of pregnancy the macroscore is all the higher (lower) as the birth comes earlier (later) ($p < 0.001$, Tab. V[a]).
Fig. 5 further shows **that the later delivery, the higher macroscore** at the end of pregnancy ($p < 0.001$, Tab. V[b]); this is shown even more clearly in Fig. 6 which gives the mean macroscore ± 1 SD of samples of amniotic fluid obtained during the last week of pregnancy in births varying from the 37 until to 43 weeks.

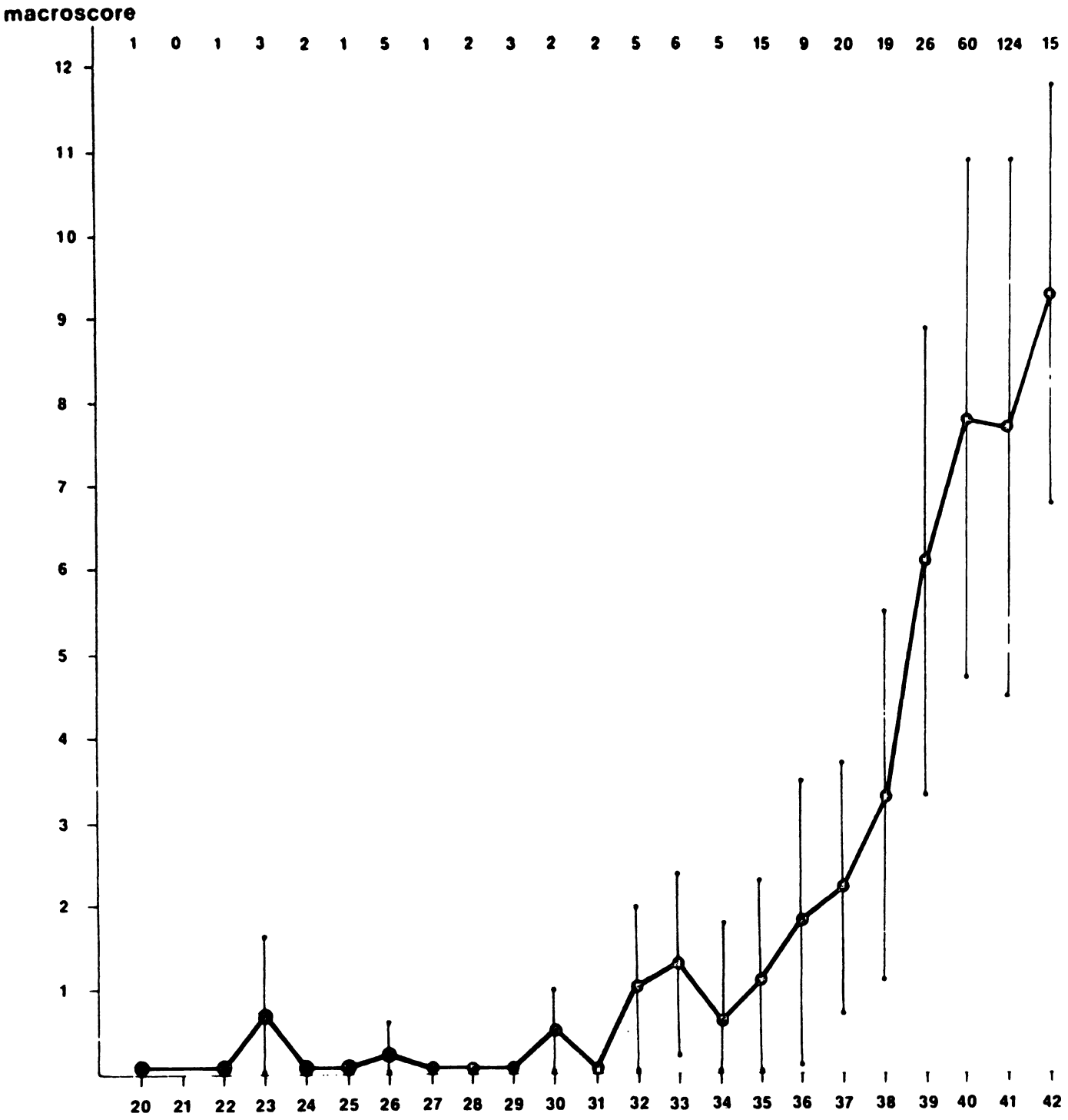

Fig. 1. Mean macroscore ± 1 SD in amniotic fluid during pregnancy. Abscissa bottom: pregnancy-week, top: number of samples, ordinate: macroscore.

4. Discussion

Changes in the appearance of amniotic fluid occur during pregnancy **from yellow, clear and without flakes during the first half of pregnancy to colourless, moderately cloudy and with a moderate number of flakes of vernix at term (Tab. I).**

The macroscore (Tab. II) gives a proper definition of this appearance.

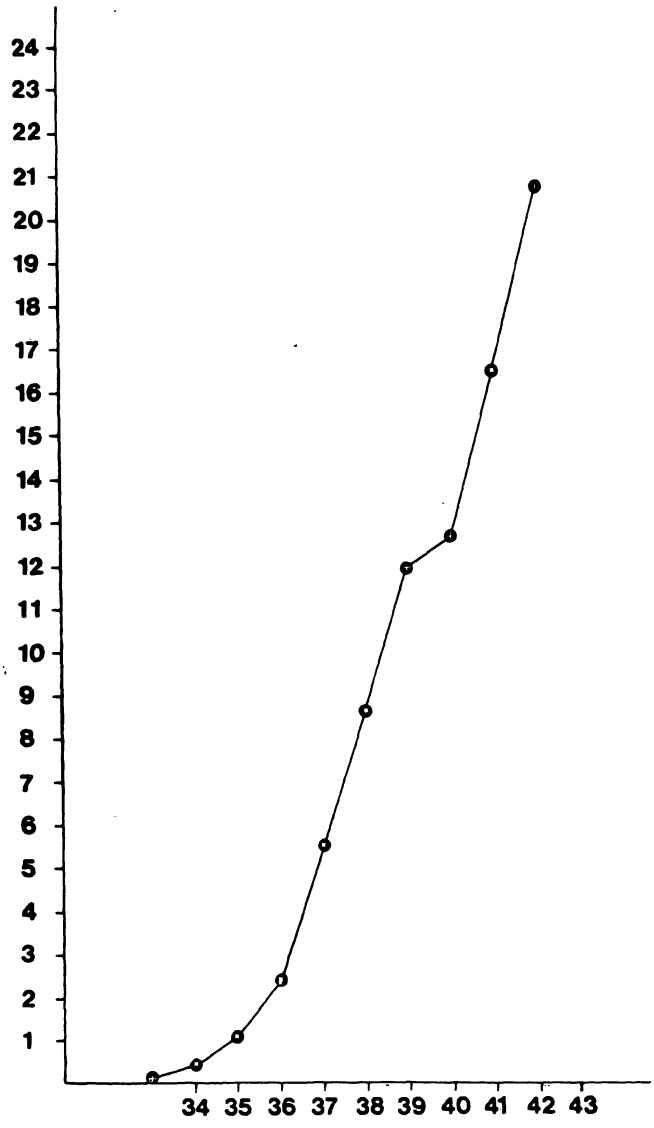

Fig. 2. Cumulative average increase of the macroscore per week during pregnancy. Abscissa: pregnancy-week, ordinate: Cumulative increase of macroscore.

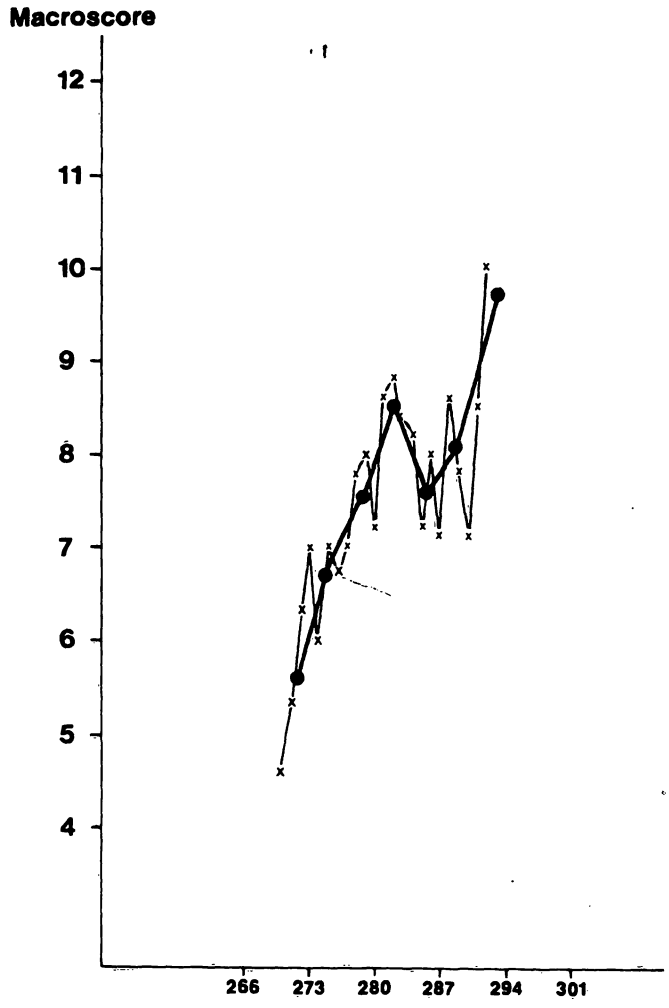

Fig. 3. Mean macroscore per day and per half week of pregnancy near term. Abscissa: pregnancy-day, ordinate: macroscore.
x——x per day
●——● per half week

There is a relation:

a) between the disappearance of the yellow colour (bilirubin) and the first occurrence of cloudiness and flakes;

b) between the duration of pregnancy and the macroscore; from the 32–36th week of pregnancy the macroscore increases until birth (Fig. 1).
An exception is the mean macroscore in the 41th week, which is lower than in the 40th week ($p < 0.05$);

c) between the total duration of gestation at birth and the progression of the macroscore during pregnancy (Fig. 5, Tab. IV); when birth takes place earlier (later) the macroscore will increase earlier (later).
This means that in the later weeks of pregnancy the macroscore is the lower (higher), the later (earlier) birth occurs ($p < 0.001$; Tab. V[a]).

d) between the total duration of gestation at birth and the macroscore at the end of pregnancy; with an earlier (later) birth the macroscore is

Tab. III. Macroscore (mean $\bar{X}$, standard deviation SD and number n) near term per day and per half week.

	Macroscore					
Pregnancy-day	per day			per half week		
	$\bar{X}$	n	SD	$\bar{X}$	n	SD
270	4.6	5	2.7			
271	5.3	3	4.2	5.6	14	2.9
272	6.3	4	2.4			
273	7.0	2	4.2			
274	6.0	2	2.8			
275	7.0	7	3.0	6.8	13	2.7
276	6.8	4	3.0			
277	7.5	4	1.0			
278	7.8	6	2.9	7.5	17	2.5
279	8.0	1	–			
280	7.2	6	3.3			
281	8.6	7	1.0			
282	8.8	9	4.1	8.5	40	2.7
283	8.4	24	2.5			
284	8.3	15	2.8			
285	7.6	25	3.6	7.7	89	3.1
286	8.0	29	2.7			
287	7.1	20	3.1			
288	8.6	15	3.2			
289	7.8	10	3.4	8.0	33	3.3
290	7.1	8	3.6			
291	8.5	6	3.7			
292	10.0	2	2.8	9.2	13	2.8
293	8.0	1	–			
294	10.0	4	1.6			

lower (higher) at the end of pregnancy (Fig. 5 and 6, Tab. IV; $p < 0.001$; Tab. V^b).

So, the macroscore, based on the appearance of the amniotic fluid, **makes it possible to determine the duration of pregnancy** after approximately the 35th week, admitedly with a certain, however determinable, margin of error.

Even more accurately it is possible to determin the time from birth (prepartal age) by the correlation between the development of the macroscore during pregnancy and the total gestation duration at birth. Both these aspects will be the subject of the thesis of one of us (VERPOEST; in preparation).

The fairly large standard deviation of the macroscores per week of pregnancy (Fig. 1) points however to a fairly large inter-individual variation in the appearance of the amniotic fluid at a certain duration of pregnancy.

This inter-individual variation will partly be caused by the relation between the total gestation duration at birth and the increase in cloudiness and flakes during pregnancy; the pregnant women of Fig. 1. did have pregnancies varying in duration at birth from 37 to 43 weeks. But even when the macroscore in a given week of pregnancy is considered in pregnancies with a given total gestation period, such as in Fig. 7 for a gestation of 40 weeks, there is still a clear inter-individual variation per pregnancy week.

The appearance of the amniotic fluid is determined **by elements originating from the fetal skin**; the cloudiness and flakes are caused by release and flaking off of vernix and cells from the stratum corneum (WOYTON 1963). No doubt there will be cells from other sources (amnion, oral cavity, respiratory and urogenital tract) present in the amniotic fluid, but these hardly contribute to its appearance.

Therefore, from the changes occurring in the appearance of the amniotic fluid conclusions may be drawn as to changes in the function of the fetal skin.

From the 32nd to 34th week of pregnancy vernix is being released, a little at first and then gradually more. The relation between the vernix layer and the duration of pregnancy is a well-known obstetrical fact; a premature newborn has much vernix, a postmature one none.

The appearance of the amniotic fluid is an indicator of the quantity of vernix that has been released; very cloudy amniotic fluid with many flakes means there is little vernix left on the skin.

The amount of cloudiness and flakes, expressed as macroscore, is therefore an indicator of the functional maturity of the fetal skin. Why the skin begins to release vernix at a given time, is the subject of a study of one of our group [3]; preliminary results indicate that it depends on the functional maturation of the eccrine sweatglands; and this maturation depends on the functional maturation of the hypothalamic central nervous system. So the macroscore may be seen as an indicator of maturation of the central nervous system.

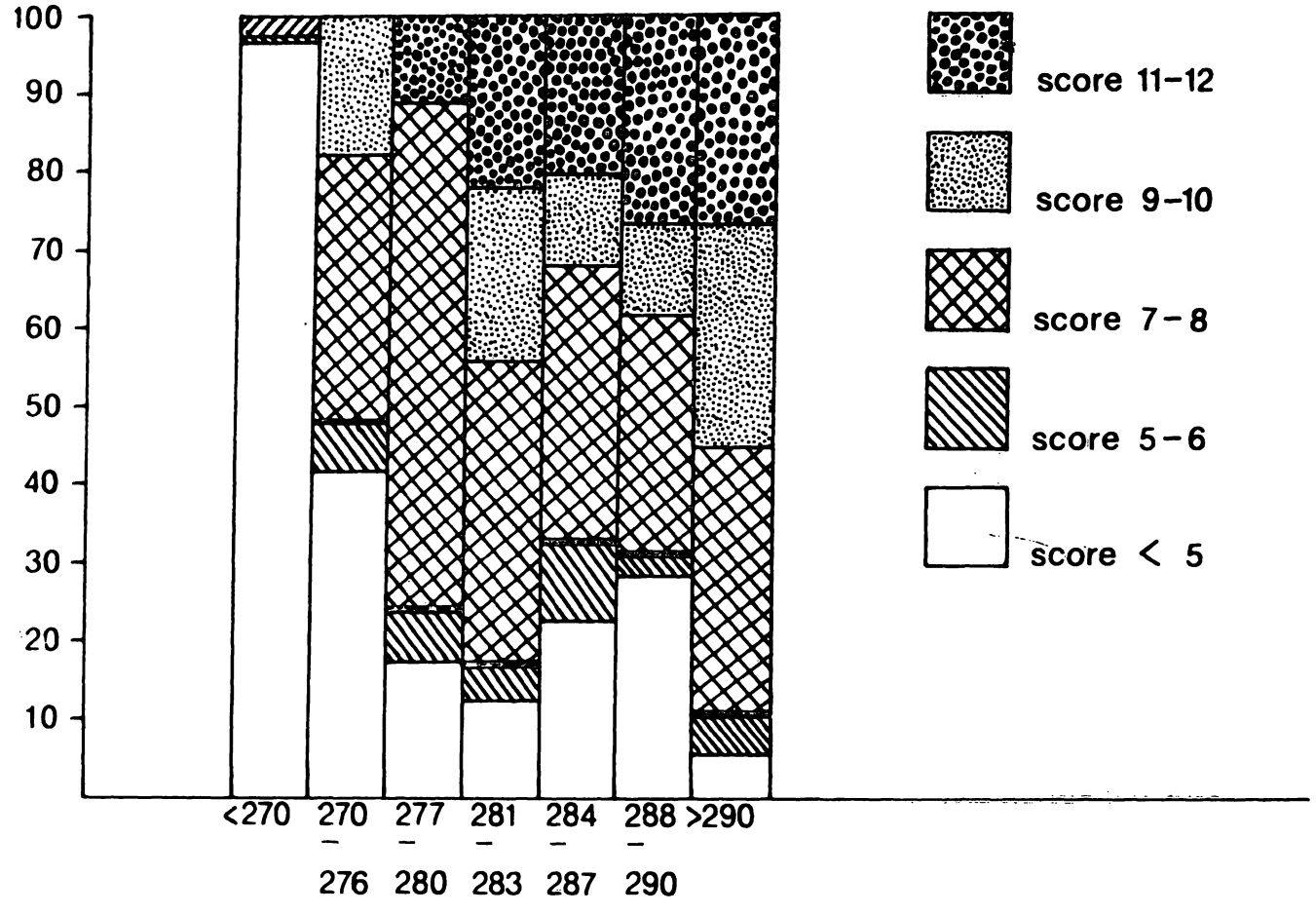

Fig. 4. Procentual macroscore distribution for different durations of pregnancy. Abscissa: pregnancy-day, ordinate: procentage.

The macroscore is only an indication of the duration of pregnancy in so far as the maturation of the fetus is correlated with this. The fairly considerable variations of the macroscore at a given duration of pregnancy (Fig. 1 and 7) indicate a great variation in fetal maturation; some mature faster, others slower. Because of the correlation between the development of the macroscore and the total duration of gestation at birth (Fig. 5, Tab. IV), the faster maturing children will be delivered earlier, the slower maturing ones later. This clearly shows the development of the child influencing the time of birth.

Apart from the degree of release of the vernix and the cells of the stratum corneum, the aspect of the amniotic fluid will also be determined by other factors, such as the amount of vernix presents, the rate of drinking by the child, and above all by the volume of the amniotic fluid.

For identical quantities of released vernix and cells will of course cause less cloudiness in a large volume of amniotic fluid than in a smaller one. The volume of amniotic fluid is dependent on the duration of the pregnancy as is its appearance, and very probably also more on the functional maturity of pregnancy than on the duration itself.

Therefore, during the later weeks of pregnancy, **released vernix and amniotic fluid volume together will reflect the increase in macroscore as a manifestation of the maturing fetus on the one hand and as a manifestation of the maturing pregnancy on the other.** The higher macroscore during the last days prior to birth in pregnancies of longer duration (Fig. 5 and 6) may possibly be explained by a greater decrease in the volume of amniotic fluid; is seems more probable that this higher macroscore at a later delivery develops because with a later delivery a less sensitive uterus requires

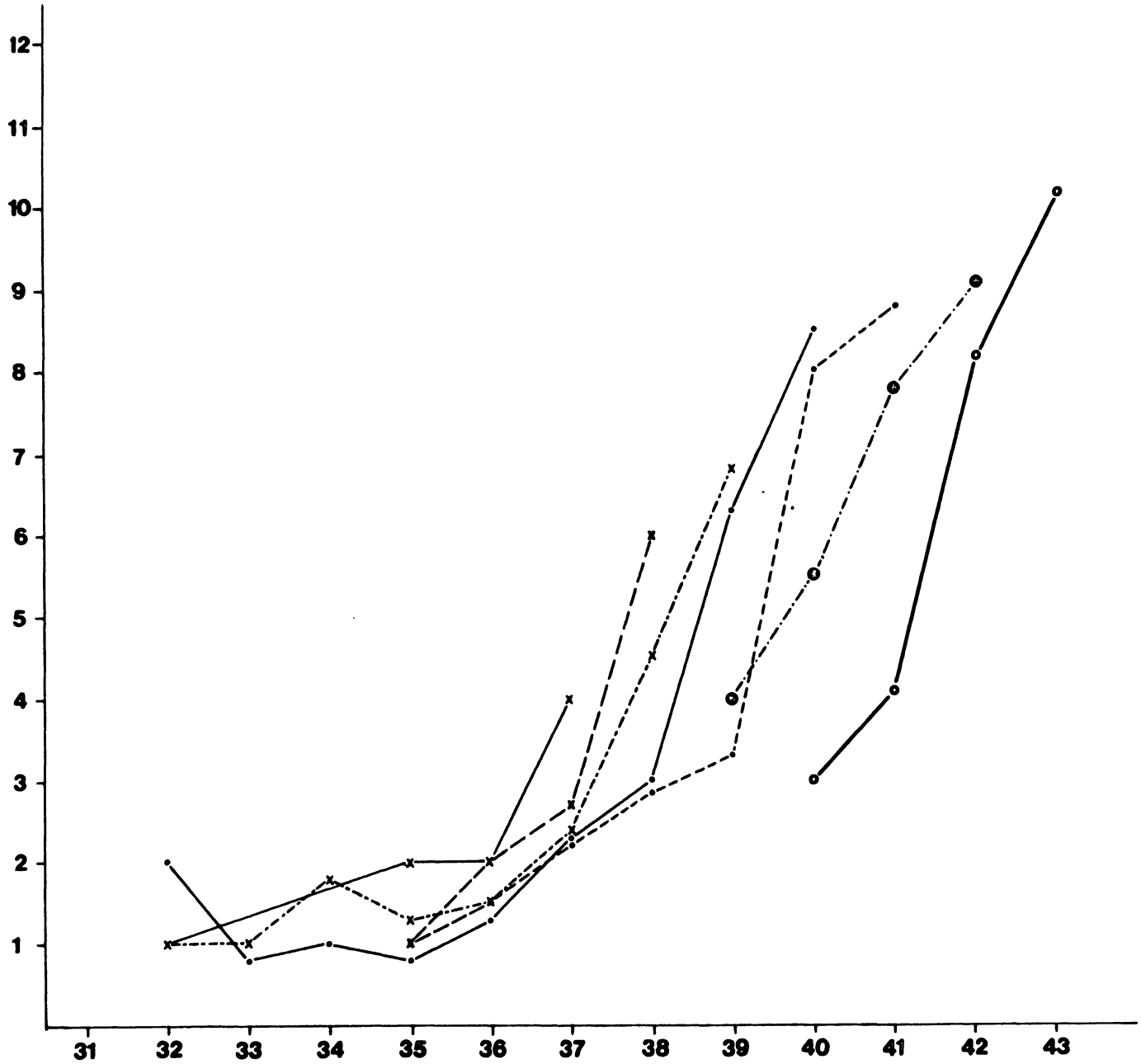

Fig. 5. Macroscore progression during pregnancy in relation to the total duration of gestation at birth. Abscissa: pregnancy-week, ordinate: macroscore.

x——x delivery 256–262 days (37 weeks)
x– –x delivery 263–269 days (38 weeks)
x·····x delivery 270–276 days (39 weeks)
·——· delivery 277–283 days (40 weeks)
·– –· delivery 284–290 days (41 weeks)
●·····● delivery 291–297 days (42 weeks)
o——o delivery 298–304 days (43 weeks)

a greater maturity of the fetus and of pregnancy for delivery to start. A fascinating aspect is the drop of the mean macroscore in the 41th week of pregnancy, caused by a sudden relative increase of amniotic fluids with lower macroscores (Fig. 4).

A lower score at a given moment means either a shorter duration of pregnancy or, with a given duration of pregnancy, a longer total gestation, i.e. a later birth.

Table VI shows the relation between the macroscore and the number of days until birth.

With a score of 11–12, 92.9% of the women will deliver within one week and 85.7% within 5 days; with a decreasing macroscore this percentage be-

Tab. IV. Macroscore (mean $\bar{X}$, standard deviation SD and number n) as a function of the duration of pregnancy in relation to the total duration of gestation at birth (all amniocenteses)

duration of pregnancy (days)	Total gestation time at birth (days) 256–262			263–269			270–276			277–283		
	$\bar{X}$	SD	n	$\bar{X}$	SD	n	$\bar{X}$	SD	n	$\bar{X}$	SD	n
31	–	–	–	–	–	1	–	–	–	–	–	–
32	1.0	1.0	2	–	–	–	1.0	1.0	2	2.0	–	2
33	–	–	–	–	–	–	1.0	–	2	0.8	1.0	5
34	–	–	–	–	–	–	1.8	1.8	4	1.0	0.9	5
35	2.0	2.0	2	1.0	0.9	5	1.3	1.2	10	0.8	0.7	8
36	2.0	2.3	6	2.0	1.6	4	1.5	1.6	12	1.3	1.1	10
37	4.0	2.3	6	2.7	1.0	7	2.4	1.3	14	2.3	1.3	16
38	–	–	–	6.0	3.0	9	4.5	2.0	23	3.0	1.8	21
39	–	–	–	–	–	–	6.8	2.3	37	6.3	2.9	40
40	–	–	–	–	–	–	–	–	–	8.5	2.3	40
41	–	–	–	–	–	–	–	–	–	–	–	–
42	–	–	–	–	–	–	–	–	–	–	–	–
43	–	–	–	–	–	–	–	–	–	–	–	–
44	–	–	–	–	–	–	–	–	–	–	–	–

duration of pregnancy (days)	284–290			291–297			298–304		
	$\bar{X}$	SD	n	$\bar{X}$	SD	n	$\bar{X}$	SD	n
31	–	–	–	–	–	–	–	–	–
32	–	–	–	–	–	–	–	–	–
33	–	–	–	3.0	–	1	–	–	–
34	–	–	–	–	–	–	–	–	–
35	1.0	1.0	2	–	–	–	–	–	–
36	1.5	0.5	2	–	–	–	–	–	–
37	2.2	0.7	6	–	–	–	–	–	–
38	2.9	1.3	10	–	–	–	2.0	–	1
39	3.3	1.6	12	4.0	–	1	–	–	–
40	8.0	2.5	42	5.5	2.1	8	3.0	0.8	3
41	8.8	2.5	74	7.8	2.9	44	4.1	2.1	14
42	–	–	–	9.1	2.5	20	8.2	2.7	19
43	–	–	–	–	–	–	10.2	2.4	12
44	–	–	–	–	–	–	–	–	–

Tab. V. Correlation (Pierson correlation coefficient P) between the macroscore at a given pregnancy week (V^a), the macroscore in the last days before birth (V^b) and the duration of pregnancy at birth.

duration of pregnancy (weeks)	correlation coefficient	number	P	days before birth	correlation coefficient	number	P
35	– 0.0032	23	–	0	– 0.492	31	0.01
36	– 0.004	27	–	1	0.490	85	0.01
37	– 0.115	43	–	2	0.535	53	0.01
38	– 0.355	57	0.01	3	0.553	43	0.01
39	– 0.409	69	0.01	4	0.665	32	0.01
40	– 0.317	77	0.01	5	0.641	27	0.01
41	– 0.562	123	0.01	6	– 0.014	26	–
42	– 0.501	71	0.01	7	0.586	25	0.01
				8	0.550	32	0.01
				9	0.256	17	–
				10	0.520	14	0.05
							0.1

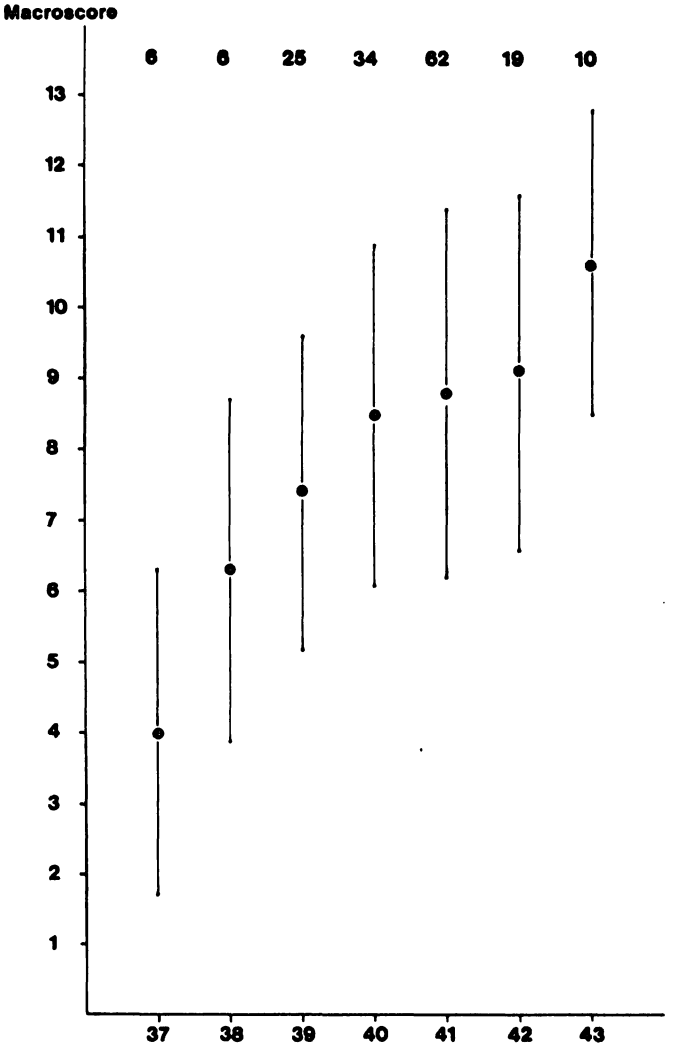

Fig. 6. Mean macroscore ± 1 SD, obtained at the last amniocentesis in the last week of pregnancy, for deliveries, varying from the 37th to the 43rd week. Abscisse bottom: delivery-week, top: number of samples, ordinate: Macroscore.

comes successively lower, a steadily increasing percentage delivers later; with a score of < 5, only 22.2% delivers within one week and 11.1% within 5 days; 51.9% of birth only takes place after more than 10 days.

The length of the period between puncture and birth for a given macroscore in a given week of pregnancy is shown in table VII. For a macroscore of < 5, and with a given duration of pregnancy, it will take an average of another 8 or 10 days before birth takes place.

The decrease in the mean macroscore during the 41th week of pregnancy is due to the emergence of a considerable group of pregnant women (approx. 25% of all pregnant women in this week) **who have a considerably longer total duration of pregnancy.** The average duration of pregnancy for this group at puncture during the first half of the 41th week is 295.4 ± 4.7 (number 13) days and at puncture during the second half of the 41th week it is 299.1 ± 7.6 (number 8) days.

The most obvious explanation for this phenomenon is that pregnant women can be divided into two groups: one group for whom physiological pregnancy lasts 280 plus minus a certain number of days, and another group for whom physiological pregnancy lasts about two weeks longer.
In addition to a physiological significance, this characteristic has an important practical significance, when treating postmaturity.

Tab. VI. Relation between macroscore and days from birth.

Macroscore	number	Frequency distribution (%) of number of days from birth						Total
		2	3–4	5–6	7–8	9–10	> 10	
11–12	28	60.7	25.0	7.1	7.1	–	–	99.9
9–10	18	55.6	27.8	–	–	16.7	–	100.1
7–8	53	39.6	18.9	18.9	11.3	7.5	3.8	100
5–6	12	33.3	25.0	16.7	8.3	8.3	8.3	99.9
5	27	7.4	3.7	11.1	25.9	–	51.9	100

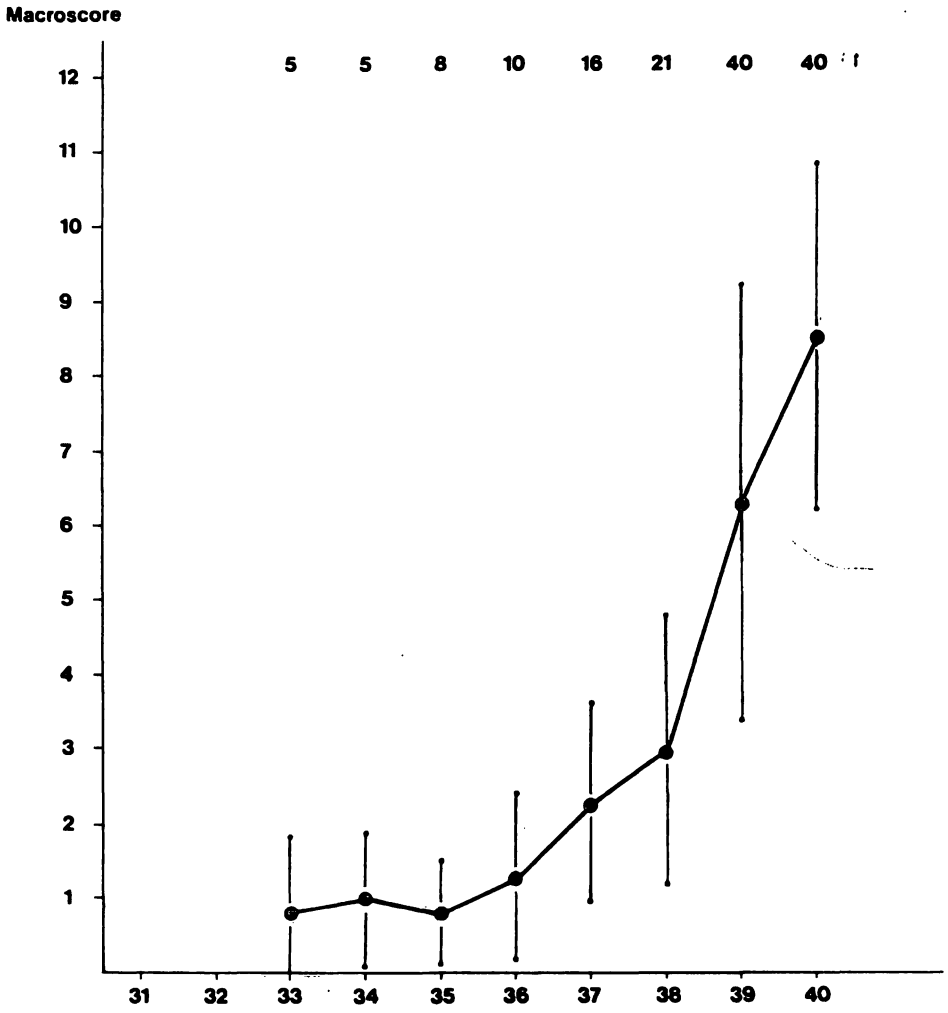

Fig. 7. Mean macroscore ± 1 SD during pregnancy for deliveries in the 40th week. Abscissa bottom: pregnancy-week, top: number of samples; ordinate: macroscore.

Tab. VII. Days (mean ± standard deviation) between puncture and delivery at a given macroscore on a given pregnancy day (number of women in brackets).

Macroscore	number of days between puncture and delivery pregnancy day of puncture			
	277–280	281–283	284-287	288–290
9–12	0 (2)	2.7 ± 1.9 (12)	3.0 ± 2.5 (21)	2.0 ± 2.3 (11)
5–8	3.6 ± 3.4 (12)	4.7 ± 3.2 (15)	4.3 ± 3.3 (29)	3.2 ± 3.2 (9)
< 5	16.5 ± 4.9 (2)	9.3 ± 3.3 (4)	9.5 ± 4.7 (13)	10.3 ± 7.3 (8)

Summary

During the first two trimesters of pregnancy the amniotic fluid is clear and yellow; during the third trimester the amniotic fluid becomes colourless; then, approximately from the 33rd–34rd week on, cloudiness and flocculation occur, at first very slowly, after the 36th–37th week steadily faster (Tab. I). At term, the amniotic fluid is moderately cloudy and contains a moderate number of flakes of vernix. The appearance of the amniotic fluid

depending on the degree of cloudiness and on the number of flakes, has been expressed by means of a score system, the socalled macroscore (**Tab. II**).

Relationships were observed:

a) between the disappearance of the yellow colour (bilirubin) and the initial occurrence of cloudiness and flocculation;

b) between the duration of pregnancy and the macroscore; from the 32nd–36th week of pregnancy the mean macroscore increases until the second half of the 40th week; then in the 41st week there is a drop in the mean macroscore, after which a new increase occurs (**Fig. 1, 2 and 3**).

c) between the total gestation period at birth and the progression of the macroscore (**Fig. 5**); when birth takes place earlier (later), the macroscore will increase earlier (later).

d) between the total duration of gestation at birth and the macroscore at the end of pregnancy; with an earlier (later) birth, the macroscore is lower (higher) (**Fig. 5 and 6**).

With the macroscore it is possible to determine the duration of pregnancy (b) and the time before birth even more accurately (c). The fairly large standard deviation of the macroscore per pregnancy week (**Fig. 1**) also in case of a given duration of gestation at birth (**Fig. 7**) points to a fairly large interindividual variation in the appearance of the amniotic fluid at a certain duration of pregnancy.

The macroscore is determined by elements originating from the fetal skin; the cloudiness and flocculation are caused by release of vernix and the flaking off of cells from the stratum corneum. **Hence the macroscore reflects changes in the function of the fetal skin and is an indicator of the functional maturation of the fetal skin.**

The considerable variation of the macroscore at a given duration of pregnancy indicates a great variation of fetal maturation. The fetus that is maturing faster, will be delivered earlier; the fetus that is maturing slower, later (c). This points to a correlation between the degree of fetal maturation and the start of labour. The higher macroscore during the last days before birth in pregnancies of longer duration (d) (Fig. 5 and 6) may be explained by a less sensitive uterus, requiring a greater maturity of the fetus for delivery to start.

The drop of the mean macroscore in the 41st week of pregnancy is due to a sudden increase of lower scores in this week (**Fig. 4**). A lower score at a given stage of pregnancy means a later birth (**Tab. VI and VII**).

Thus in the 41st week of pregnancy a considerable group of pregnant women appears, that has a total duration of gestation that is, on the average, two weeks longer than normally. The most obvious explanation is that pregnant women can be divided into two groups:

one for whom physiological pregnancy lasts about 280 days, the other for whom physiological pregnancy lasts two weeks longer. This has an important practical significance in cases of postmaturity.

Keywords: amniotic fluid, appearance, fetal skin, fetus, macroscore, maturation, pregnancy, vernix.

Zusammenfassung

Veränderungen im Aussehen des Fruchtwassers während der Schwangerschaft – der Macroscore

Während des ersten und zweiten Trimenons zeigt das Fruchtwasser eine hellgelbe Farbe, dann tritt im Laufe des dritten Trimenons ein farbloser Aspekt auf. Von der 33.–34. Woche erscheinen kleine Flöckchen und eine Trübung mit einer raschen Zunahme nach der 36.–37. Woche (**Tab. I**).

Mit Hilfe eines Punktesystems, des sogenannten Macroscore wird das **Aussehen des Fruchtwassers aufgrund des Trübungsgrades und der Flockendichte** zum Ausdruck gebracht (**Tab. II**).

Unsere Untersuchungen ergaben folgende Beziehungen:

a) zwischen dem Verschwinden der gelben Farbe (Bilirubin) und dem Zeitpunkt des Auftretens von Trübung und Flöckchen.

b) zwischen der Schwangerschaftsdauer und dem Macroscore: Von der 32.–36. Woche steigt der mittlere Macroscore bis in die zweite Hälfte der 40. Woche an. In der 41. Woche folgt eine Abnahme, später nimmt der mittlere Macroscore wiederum zu (**Fig. 1, 2 und 3**).

c) zwischen der Schwangerschaftsdauer zum Zeitpunkt der Geburt und dem Verlauf des Macroscores (**Fig. 5**). Findet die Geburt früher bzw. später statt, so steigt der Macroscore früher, bzw. später an.

d) zwischen der Schwangerschaftsdauer zum Zeitpunkt der Geburt und dem Macroscore am Ende der Schwangerschaft: Bei einer früher bzw. später stattfindenden Geburt ist der Macroscore niedriger, bzw. höher (**Fig. 5 und 6**).

Anhand unseres Macroscore ist es möglich, die Schwangerschaftsdauer zu bestimmen (b) und mit einer größeren Genauigkeit die Zeitspanne bis zur Geburt (präpartuales Alter) festzulegen (c).

Die bemerkenswert große Variation des Macroscore zu jedem Zeitpunkt der Schwangerschaft (**Fig. 1**) weist auf eine ziemlich große individuelle Variation des Fruchtwasseraspektes hin, dies gilt auch dann, wenn die Geburt bei einer gegebenen Schwangerschaftsdauer erfolgt (**Fig. 7**).

Der Macroscore wird durch Elemente, welche von der fetalen Haut herrühren, bestimmt: Trübung und Flockendichte werden durch die Emulgierung der Vernix und die Abschuppung von Zellverbänden des stratum corneum bedingt. **Somit ist der Macroscore ein Parameter für die funktionelle Reifung der fetalen Haut.** Die bedeutende Variation des Macroscore zu jedem Zeitpunkt der Schwangerschaft weist auf große individuelle Unterschiede des fetalen Reifegrades hin. Je fortgeschrittener der Reifegrad, um so früher erfolgt die Geburt, je langsamer die fetale Reifung erfolgt, um so später wird das Kind geboren (c). Es besteht eine Korelation zwischen dem Reifegrad und

dem Geburtstermin. Die interessante Beobachtung, daß der Macroscore am Ende der Schwangerschaft bei einer früher stattfindenden Geburt niedriger, bei einer später stattfindenden Geburt höher ist, läßt sich vielleicht dadurch erklären, daß eine weniger empfindliche Uterusmuskulatur eine größere Reifung des Feten erfordert um mit Wehenbeginn zu reagieren.

Das Absinken des mittleren Macroscore in der 41. SSW wird verursacht durch eine rasch erfolgende prozentuale Zunahme von Fruchtwasser mit einem niedrigen Score (Fig. 4).

Weil ein erniedrigter Macroscore bei einer gegebenen Schwangerschaftsdauer eine spätere Geburt bedeutet (Tab. VI und VII), ist in der 41. SSW eine Gruppe von Frauen zu eruieren, deren Gesamtschwangerschaftsdauer eine normale Schwangerschaftsdauer um durchschnittlich 2 Wochen überdauert. Wir schließen daraus, daß schwangere Frauen in zwei Gruppen einzuteilen sind, von denen die einen eine physiologische Schwangerschaftsdauer von 280 Tagen, die andere eine um zwei Wochen verlängerte physiologische Schwangerschaftsdauer aufweist. Diese Interpretation hat eine große praktische Bedeutung zur Beurteilung der Übertragung.

Schlüsselworte: Fruchtwasser (Aussehen), Haut (fetale), Macroscore, Reifegrad, Schwangerschaft, Vernix.

Résumé

Altérations de l'aspect du liquide amniotique durant la grossesse – Le macroscore

Durant les premier et deuxième trimestre de la grossesse, le liquide amniotique est de couleur jaune clair et devient incolore au cours du troisième trimestre. Entre la 33ème et 34ème semaine apparaissent des petits flocons et un aspect trouble qui augmentent rapidement après les 36.–37ème semaines (Tab. I).

A l'aide d'un système de points, ledit macroscore, nous avons pu définir **le degré de trouble et la densité des flocons du liquide amniotique (Tab. II)** et établir les rapports suivants:

a) entre la disparition de la couleur jaune (bilirubine) et le moment d'apparition du trouble et des flocons;
b) entre la durée de grossesse et le macroscore: Le macroscore moyen monte de la 32.–36ème semaine jusqu'à la seconde moitié de la 40ème semaine, Puis succède une baisse dans la 41ème semaine après laquelle le macroscore moyen commence à remonter (Fig. 1, 2 et 3);
c) entre la durée de grossesse au moment de l'accouchement et la courbe du macroscore (Fig. 5). Selon que la naissance a lieu plus ou moins tôt, le macroscore monte plus ou moins tôt;
d) entre la durée de grossesse au moment de l'accouchement et le macroscore à la fin de la grossesse: La hausse du macroscore suit la courbe de la date de la naissance (Fig. 5 et 6).

A l'aide de notre macroscore il est possible de déterminer la durée de grossesse (b) et de fixer avec plus grande précision le délai jusqu'à la naissance (âge prépartuel) (c). La variation étonnamment grande du macroscore pour chaque période de la grossesse (Fig. 1) reflète une variation individuelle assez grande de l'aspect du liquide amniotique, même lorsque la naissance a lieu dans une durée de grossesse donnée (Fig. 7).

Le macroscore est déterminé par des éléments qui proviennent de la peau du foetus: le trouble et la densité des flocons résultent de l'émultionnement de la vernix et de l'écaillage d'agglomérés cellulaires du stratum corneum. **Le macroscore représente ainsi un paramètre pour la maturation fonctionnelle de la peau foetale.** L'importante variation du macroscore à chaque moment de la grossesse résulte de grandes différences individuelles dans le degré de maturité foetale. Plus ce degré est avanceé, plus tôt aura lieu l'accouchement et, inversement, l'enfant naîtra d'autant plus tard que la maturation foetale se fait lentement (c). Il existe bien, comme on le voit, une corrélation entre le degré de maturité et la date de l'accouchement. L'observation intéressante que le macroscore à la fin de la grossesse est plus bas à une naissance plut lot et plus haut à une naissance plus tarde, s'explique peut-être du fait qu'une musculature moins sensible nécessite une plus grande maturation du foetus pour que se déclenche l'induction du travail.

La baisse du macroscore moyen dans la 41ème semaine de grossesse est causée par une augmentation procentuelle rapide du liquide amniotique (Fig. 4).

Etant donné que pour une durée de grossesse indiquée, une baisse du macroscore signifie un retard de la naissance (Tab. VI et VII), il faut découvrir parmi les patientes se présentant dans la 41ème semaine de grossesse celles dont la durée totale de grossesse dépassera de deux semaines en moyenne la durée normale. Nous en concluons que les femmes enceintes doivent être réparties en deux groupes dont l'un comporte une durée de grossesse physiologique de 280 jours et l'autre de deux semaines de plus. Cette interprétation est d'une grande importance pratique pour l'examen de la transmission.

Mots-clés: Liquide amniotique, aspect, peau foetale, foetus, macroscore, maturation, grossesse, vernix.

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